From the succession of Collatz Personalized, the veracity of the same can be deduced

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Summary

One of the problems of elementary mathematics, still unsolved, is the Collatz conjecture (after the mathematician Lothar Collatz). It concerns the following function between natural numbers: f: N→ N with f(N)= N/2 if N is even or f(N)=(3*N+1) if N is odd.

By iterating the function several times, after a certain number of iterations we get the number 1 and continuing the iterations we have the cycle $1 \rightarrow 4 \rightarrow 2 \rightarrow 1$. Then the initial number *N*, in subsequent iterations, is multiplied by 3 (adding 1) and divided by 2, so that we have a succession of odd steps (when multiplying by 3 and adding 1) and even passes (when dividing by 2) that, after a certain total number of even *passes bi* and a certain total number of odd steps *to*, converges to 1.

In my 2 previous papers, a custom sequence of the Collatz function has been defined, formulated on a modular basis and oriented to reduce the number of iterations required for convergence. Thanks to algorithmic coding and a diagrammatic structure, the method allows for simplified tracking of odd and even steps, with obvious computational advantages.

In this work I also verify **Theorem No. 6.2 of reference [1]** and prove the same using the **Theorem of the intersection of two lines** in paragraph 5.

1 Introduction

In my sequence of Collatz, personalized and faster, only odd numbers are used (after a possible initial number that can also be even modulo 4) congruent odd numbers congruent to 1 mod 4 and congruous 3 mod 4. The latter represent 50% of a group of consecutive integers and of these, half (25%) are congruous 1 mod 4, which always have a subsequent number in the sequence that is less than the previous one, and the other half (25%) are congruous 3 mod 4, which according to **Important Consideration 5.1** and **Note 6.2 of reference [1]** have a probability of 10.9375% (out of 25%) of having a subsequent number in the sequence that is less than the previous one.

So, in conclusion, the sequence I customized, which uses only odd numbers, in each iteration has a 35.9375% probability (i.e., almost 36 numbers out of 50) of having a subsequent number in the sequence that is less than the previous one and a probability of 14.0625% (i.e., almost 14 numbers out of 50) of having a subsequent number in the sequence that is greater than the previous one.

In this new work of mine we will study in depth the behavior of the values in each iteration *of the* variables $T1_i$ e $T2_i$, and the corresponding value $b_i - a_i = T1_i + 2 \cdot T2_i$. We remind you that $T1_i$ is the sum of all previous iterations, including the considered iteration, in which there has been an increase of 1 unit in the difference between $b - a$ (point 4 and point 6 of the custom sequence), and where *T2i* is the sum of all previous iterations, including the considered iteration, in which there has been an increase of 2 units in the difference between $b - a$ (point 3 and point 5 of the custom sequence).

In addition, we will study in depth in the Cartesian plane, in each iteration i, the passage between the previous point $P_{i-1}(a_{i-1};b_{i-1} - a_{i-1})$ and the next one $P_i(a_i;b_i - a_i)$, then between the points $P_{i-1}(a_{i-1};T1_{i-1} +2\cdot T2_{i-1})$ and $P_i(a_i;T1_i +2\cdot T2_i)$, which are, in the Cartesian plane itself, the extremes of consecutive segments that form an open and simple line in which each segment is inclined by a positive E value, which depends on the 6 points of the custom sequence. Also remember that in each iteration the total of even steps (which I indicate with b_i) is always greater than the total of odd passages (which I indicate with a_i), that is, we have $b_i > a_i$, and in subsequent iterations we have that bi increases more than a_i, This is because the difference between the total of even and odd passes always increases by 1 or 2 units in each iteration. This produces, in subsequent iterations, a difference between b_i and a_i that is always increasing.

2 Custom Collatz Succession

From the textual representation of the personalized Collatz sequence (see paragraph 2 of reference [2]), on the basis of the 6 points of the same, we establish how in the Cartesian plane, for each iteration i, the passage between the points occurs $P_{i-1}(a_{i-1}; b_{i-1} - a_{i-1})$ and $P_i(a_i; b_i - a_i)$, or between $P_{i-1}(a_{i-1}; T1_{i-1} + 2 \cdot T2_{i-1})$ and $P_i(a_i; T1_i + 2 \cdot T2_i)$, and calculate the slope of the segment $P_{i-1}P_i$.

Important note: The following sequence customized by me applies to all integers **N other than (2^p-1)/3 with p>=2 and with p even integer i.e. the set {1 – 5 – 21 – 85 – 341 – 1365 - ....}. In fact these (2^p-1)/3 odd and integers satisfy the Collatz conjecture and immediately converge to 1 after only one odd step and p even passes** (insert this condition in the python program because it may occur during subsequent iterations**).** In fact, applying the odd passage 3*N+1 to them we obtain the number **2^p** which after p even passages converges to 1. In this case odd increase equal to **1** and even increase equal to **p** so the difference between even and odd steps is equal to **p-1** so *Pi-1* = (*x, y*) starting point, *Pi* = (*x+1, y+p-1*) next point, increasing oblique segment with *mi* = p and length equal to the square root of p^2-2*p+2.

- Point 1: $N \equiv 0 \bmod 4$, namely $N = 2^p(1+2k)$ **with N starting number**

- After p even passes, the next is 1 + 2k
- If k is even, then 1 + 2k ≡ 1 mod 4; if k is odd 1 + 2k ≡ 3 mod 4
- Increase: $a_1 = 0$, $b_1 = p$, therefore $b_1 - a_1 = p$
- $P_0 = (0,0)$ Start point, $P_1 = (0, p)$ Next Point, Vertical Segment, $m_i = +\infty$, length = p

- Point 2: $N \equiv 2 \bmod 4$**,** namely $N = 4k + 2$ **with N starting number**

- After 1 even pass, the next is 2k + 1
- If k is even, then 2k + 1 ≡ 1 mod 4; if k is odd 2k + 1 ≡ 3 mod 4
- Increase: $a_1 = 0$, $b_1 = 1$, therefore $b_1 - a_1 = 1$
- $P_0 = (0,0)$ Start point, $P_1 = (0,1)$ Next Point, Vertical Segment, $m_i = +\infty$, length = 1

- Point 3: $N \equiv 1 \bmod 4$**,** with $N = 4(1 + 2k) + 1$

- After 0 odd and 2 even passes, the next is 1 + 2k
- If k is even, then 1 + 2k ≡ 1 mod 4; if k is odd 1 + 2k ≡ 3 mod 4
- Increase: $a_i = 0$, $b_i = 2$, therefore $b_i - a_i = 2$
- $P_{i-1} = (x, y)$ Start point, $P_i = (x, y + 2)$ Next point, vertical segment, $m_i = +\infty$, length = 2

- Point 4: $N \equiv 1 \bmod 4$**,** with $N = 4(2k) + 1$

- After 1 odd pass and 2 even, the next one is 6k + 1

- If k is even, then 6k + 1 ≡ 1 mod 4; if k is odd, 6k + 1 ≡ 3 mod 4
- Increase: $a_i = 1$, $b_i = 2$, therefore $b_i - a_i = 1$
- $P_{i-1} = (x, y)$ Start point, $P_i = (x+1, y+1)$ next point, increasing oblique segment with $m_i = 1$ and length equal to the square root of 2;

- Point 5: $N \equiv 3 \bmod 4$**, with** $N = 2^p(1+2k) - 1$ **with k and p both even or both odd and with k ≥ 0 e** $p \geq 2$

- After $p - 1$ odd and $p + 1$ even, the next is [3^(p-1)*(1+2*k)-1]/2
- Increase: $a_i = p - 1$, $b_i = p + 1$, therefore $b_i - a_i = 2$
- $P_{i-1} = (x, y)$ Start point, $P_i = (x+p-1, y+2)$ next point, increasing oblique segment with m=2/(p-1), dependent on p (see TABLE 1) and with a length equal to the square root of $[4 + (p - 1)^2]$

- Point 6: $N \equiv 3 \bmod 4$**,** con $N = 2^p(1 + 2k) - 1$ **with k even and p odd or with k odd and p even and with k** ≥ 0 **and** $p \geq 2$

- After p odd passages and $p + 1$ even, the next is [3^(p)*(1+2*k)-1]/2
- Increase: $a_i = p$, $b_i = p + 1$, therefore $b_i - a_i = 1$
- $P_{i-1} = (x, y)$ starting point, $P_i = (x+p, y+1)$ next point, increasing oblique segment with m=1/p, dependent on p (see TABLE 2) and with a length equal to the square root of $[1 + (p)^2]$

TABLE 1 and 2 of inclination

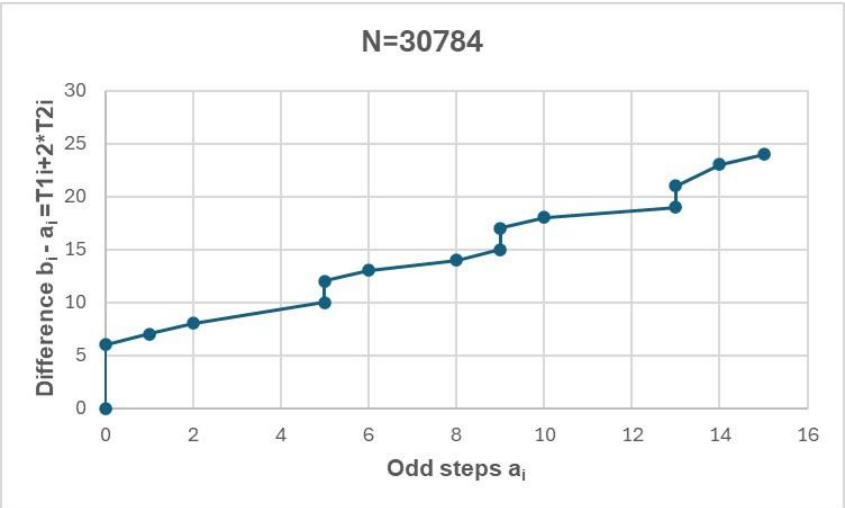
Point 5	m=2/(p-1)	Point 6	m=1/p
2	2.0000	2	0.5000
3	1.0000	3	0.3333
4	0.6667	4	0.2500
5	0.5000	5	0.2000
6	0.4000	6	0.1667
7	0.3333	7	0.1429
8	0.2857	8	0.1250
9	0.2500	9	0.1111
10	0.2222	10	0.1000
11	0.2000	11	0.0909
12	0.1818	12	0.0833
13	0.1667	13	0.0769
14	0.1538	14	0.0714
15	0.1429	15	0.0667
16	0.1333	16	0.0625
17	0.1250	17	0.0588
18	0.1176	18	0.0556
19	0.1111	19	0.0526
20	0.1053	20	0.0500

Figure 1: Custom Collatz sequence on the initial number N=30784

Iterations	step	N	Point of succession	Odd steps	Even steps	b-a=T_{1i}+2*T_{2i}
0		30784		0	0	0
1	6	481	Point 1 with p=6 and m=+∞	0	6	6
2	9	361	Point 4 with m=1	1	8	7
3	12	271	Point 4 with m=1	2	10	8
4	20	229	Point 5 with p=4 and m=0,6667	5	15	10
5	22	57	Point 3 with m=+∞	5	17	12
6	25	43	Point 4 with m=1	6	19	13
7	30	49	Point 6 with p=2 and m=0,5	8	22	14
8	33	37	Point 4 with m=1	9	24	15
9	35	9	Point 3 with m=+∞	9	26	17
10	38	7	Point 4 with m=1	10	28	18
11	45	13	Point 6 withp=3 and m=0,3333	13	32	19
12	47	3	Point 3 with m=+∞	13	34	21
13	51	1	Point 5 with p=2 and m=2	14	37	23
14	54		Point 4 with m=1	15	39	24

Let's check the custom Collatz sequence on the initial number N = 30784 by observing the open and simple line formed by the initial points $P_{i-1}(a_{i-1}; T1_{i-1} + 2 \cdot T2_{i-1})$ and final P_i $(a_i; T1_i + 2 \cdot T2_i)$ of every iteration i in the Cartesian plane. The line formed by 14 consecutive segments (equal to the number of iterations) has as its starting point $P_0(0;0)$ and end point $P_{14}(15;24)$. The line joining these two points has an inclination: m = 24/15= 1.6 > 0.5849625 and has as its starting point P0 (0;0).

Figure 2: Custom Collatz sequence on the starting number N=30784



3 When *N* converges to 1

The succession of odd numbers of the custom sequence to the initial number N depends, in each iteration, on the values of a_i and b_i, with b_i which always increases compared to a_i. Thus, the initial number N converges to 1 when, in a given iteration s, a value of b_s and a_s such that $b_s > a_s$ and inequality occurs: $[3^{(a_s)}*N] / [2^{(b_s)}] < 1$

Passing the logarithm: $a_s * \log(3) - b_s * \log(2) + \log(N) < 0$ from which the following inequalities derive: $\mathbf{b_s > a_s*log(3)/log(2)+ log_2(N)}$ and $\mathbf{b_s-a_s> a_s*log(3/2)/log(2) + log_2(N)}$

namely $\mathbf{b_s > a_s*1,5849625+ log_2(N)}$ and $\mathbf{b_s-a_s> a_s*0,5849625 + log_2(N).}$

Being $b_s - a_s$ and b_s integers, is rounded to the next integer:

$\mathbf{b_s = ARR.ECC\ [a_s *1,5849625+ log_2(N)]}$ e $\mathbf{b_s - a_s = ARR.ECC\ [a_s *0,5849625+log_2(N)]}$

These two equalities, when tested for unique values of a_s and b_s, converge the initial number N to 1, proving that the conjecture is true for every positive integer N. The iteration s in which the two equalities are verified is unique, since in each **iteration *i* prior to *s*** ($\mathbf{i < s}$) the following inequalities occur:

$\mathbf{b_i < ARR.ECC\ [a_i *1,5849625+ log_2(N)]}$ **e** $\mathbf{b_i - a_i < ARR.ECC\ [a_i *0,5849625+log_2(N)].}$

Associated discrete function

Consider the increasing line associated with the initial number N: $y = [a_i *0,5849625+\log_2(N)]$ in a Cartesian plane, where the values of the x-axis are those of a_i. For each iteration i, we define the discrete function (with its value rounded to the next whole number):

$f(a_i) = ARR.ECC\ [a_i *0,5849625+\log_2(N)]$

This function has a trend similar to the increasing line of angular coefficient $m = 0.5849625$ and starting point: $Q = (0; \log_2(N))$.

The graph of the function f is an open and simple line formed by increasing segments with a constant inclination, which join the previous point in each iteration $Q_{i-1}(a_{i-1}; f(a_{i-1}))$ with the next point $Q_i\ (a_i; f(a_i))$. It is clear that, if the initial number N converges to 1 in an iteration s of the custom sequence, there will be equality between the difference $b_s - a_s = T1_s + 2 \cdot T2s$ is the function f computed in a_s, namely: $f(a_s) = b_s - a_s = T1_s + 2 \cdot T2_s$

that is, the two broken lines meet at the point: $(a_s; f(a_s)) = (a_s; b_s - a_s)$.

We verify equality $f(a_s) = b_s - a_s = T1_s + 2 \cdot T2_s$ considering the initial number $N = 30784$, and calculate the values of a_i and $f(a_i)$ in the following TABLE 3 and in the corresponding graph of the line in a system of Cartesian axes. In this case: $\log_2(N) = \log_2(30784) = 14.909$

The line is: $y = a_i \cdot 0.,5849625 + 14.909$ and $f(a_i) = [a_i \cdot 0,5849625 + 14.909]$

where the value of the function f is rounded to the next whole number.

Figure 3: Table 3

	N	Point of succession	Odd steps	Even steps	$b-a=T_{1i}+2*T_{2i}$	$y=a_i*0,5849625+14,909$	$f(ai)=ai*0,5849625+14,909$
	30784		0	0	0	14,909	15
6	481	Point 1 with p=6 and m=+∞	0	6	6	14,909	15
9	361	Point 4 with m=1	1	8	7	15,4939625	16
12	271	Point 4 with m=1	2	10	8	16,078925	17
20	229	Point 5 with p=4 and m=0,6667	5	15	10	17,8338125	18
22	57	Point 3 with m=+∞	5	17	12	17,8338125	18
25	43	Point 4 with m=1	6	19	13	18,418775	19
30	49	Point 6 with p=2 and m=0,5	8	22	14	19,5887	20
33	37	Point 4 with m=1	9	24	15	20,1736625	21
35	9	Point 3 with m=+∞	9	26	17	20,1736625	21
38	7	Point 4 with m=1	10	28	18	20,758625	21
45	13	Point 6 withp=3 and m=0,3333	13	32	19	22,5135125	23
47	3	Point 3 with m=+∞	13	34	21	22,5135125	23
51	1	Point 5 with p=2 and m=2	14	37	23	23,098475	24
54		Point 4 with m=1	15	39	24	23,6834375	24

Figure 4:

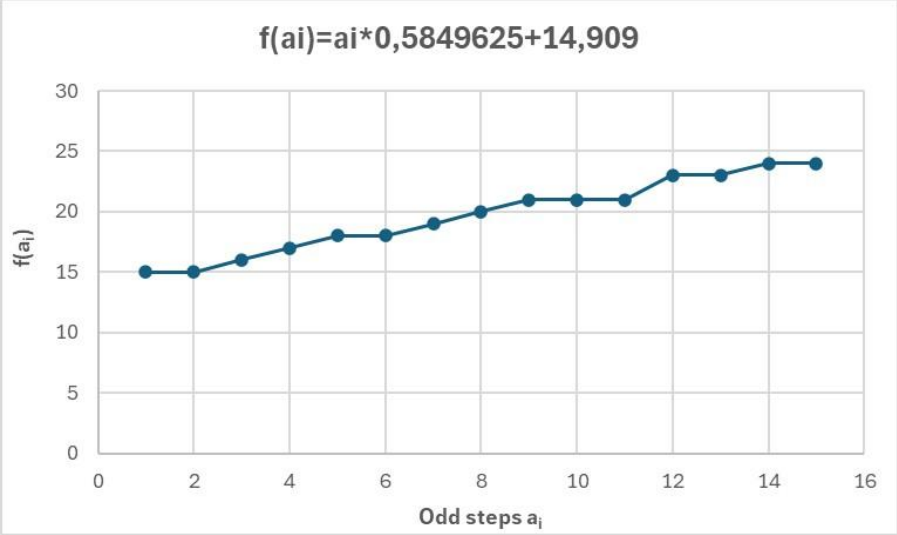
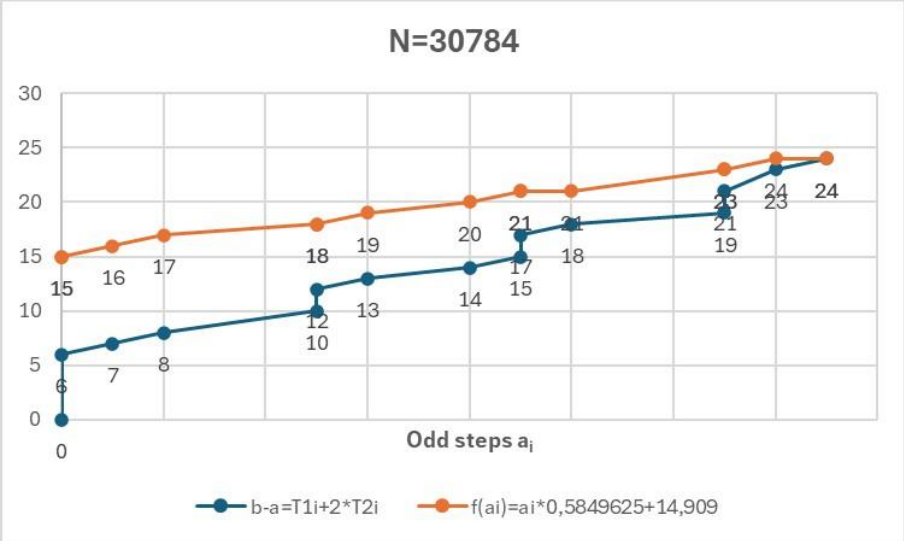


Figure 5:



In the graph of figure 5 above, we now compare, in the same Cartesian diagram, the ascending, open and simple line formed by the initial points $P_{i-1}(a_{i-1}; T1_{i-1} + 2 \cdot T2_{i-1})$ and final P_i $(a_i; T1_i + 2 \cdot T2_i)$ of each iteration i of the same starting number N = 30748, with the increasing, open and simple line of the function $f(a_i)$. From TABLE 3 and figure 5 it is verified that there is indeed an iteration s = 14 in which the two equalities are verified with their respective values rounded to the next whole number:

b_s = ARR.ECC [a_s *1,5849625+ $\log_2(N)$] and $b_s - a_s$= ARR.ECC [a_s *0.5849625+$\log_2(N)$]

In this specific case:

$$b_{14} = 39, \quad a_{14} = 15, \quad b_{14} - a_{14} = 24$$

whereby: $f(15) = b_{14} - a_{14}$ = ARR.ECC [23.68] = 24

and: b_{14} = ARR.ECC [a_{14} *1,5849625+ $\log_2(N)$] = ARR.ECC [38.68] =39

Therefore, the open and simple line has a starting point $P_0(0;0)$ in the origin of the axes and, considering the end point $P_{14}(15;24)$, it has a final inclination m=24/15 = 1.60

The function $f(a_i)$ has a similar trend to the ascending line:

$$y = [a_i * 0.5849625 + \log_2(N)]$$

angular coefficient $m = 0.5849625$, where the value of y rounds to the next whole number. The starting point of the line is: $Q=(0; \log_2(N))$ with $\log_2(N)>0$, so Q is on the positive y-axis.

Thus, the occurrence of the two correlated equalities depends on the intersection of the two open and simple segments. This intersection exists because the final slope $m = 1.6$ of the custom segment is greater than the inclination $m = 0.5849625$ of the broken of the function $f(a_i)$, which has the starting point Q on the positive axis of y.

4 The open and simple line in the individual succession

From paragraph 2 we know that the open and simple line is formed by increasing segments, each with an inclination m depending on one of the six points of the custom sequence, as follows:

- **Point 1** → Vertical and growing segment with $m = +\infty$, therefore $m > 0.5849625$, and increase on the ordinate equal to p.

  Point 2 → Vertical and increasing segment with $m = +\infty$, then $m > 0.5849625$, and increment on the ordinate equal to 1.

- **Point 3** → Vertical and increasing segment with $m = +\infty$, then $m > 0.5849625$, and increment on the ordinate equal to 2.

  Punto 4 → Oblique and increasing segment with $m = 1$, then $m > 0.5849625$, and increment on the ordinate equal to 1.

  Point 5 → Oblique and increasing segment with m=2/(p-1), dependent on p. We have $m > 0.5849625$ only if $2 \le p \le 4$, and increment on the ordinate equal to 2 (see TABLE 1). In this case, the probability of having $m > 0.5849625$ is 10.9375% out of the 25% of odd numbers congruent to 3 mod 4 (see **Important Consideration 5.1 and Note 6.2 of reference [1]**).

- **Point 6** → Oblique and increasing segment with m=1/p, dependent on p. We always have $m < 0.5849625$ for every $p \ge 2$, and an increment on the ordinate equal to 1 (see TABLE 2). In this case, the probability of having $m > 0.5849625$ is 0%, while the probability of always having $m < 0.5849625$ is 14.0625% out of the 25% of odd numbers congruent to 3 mod 4 (**see Important Consideration 5.1 and Note 6.2 of reference [1]**).

Analysis of segment inclinations in open and simple segment

Therefore, after any even initial number N on which point 1 or point 2 of the sequence is applied, in the custom sequence we continue with:

odd numbers ≡ 1 (mod 4), where points 3 or 4 of the custom sequence apply;
odd numbers ≡ 3 (mod 4), where points 5 or 6 of the custom sequence apply.

In the case of odd numbers ≡ 1 (mod 4) (which represent 25% of a set of numbers including, for example, 1 and 2^n), the corresponding segment in the open and simple line always has an inclination:

$$m > 0.5849625$$

In the case of odd numbers ≡ 3 (mod 4), the behavior is more articulated:

The segment has an inclination $m > 0.5849625$ only for point 5, when k and p are both even or both odd and with $2 \leq p \leq 4$. These numbers represent 10.93750% of 25%.

For the remaining odd numbers $\equiv 3 \pmod 4$, namely:

point 5 with $p \geq 5$ when k and p are both even or both odd,

point 6 with $p \geq 2$ when k is even and p is odd or vice versa,

the corresponding segment has inclination:

$$m < 0.5849625$$

and represents 14.06250% of 25%.

Therefore, in each iteration we have:

a 35.9375% probability of obtaining in the open and simple segment a segment with an inclination $m > 0.5849625$, i.e. almost 36 segments out of 50. In this case, the line tends to intersect with the line of the function $f(ai)$.

a 14.06250% probability of obtaining a segment with an inclination $m < 0.5849625$, i.e. almost 14 segments out of 50. In this case, the line is always increasing but less than the function $f(ai)$, and therefore the intersection with $f(ai)$ is postponed to subsequent iterations.

5 Formal demonstration of the intersection between two lines

Preliminary definitions

Let N be a positive integer. Let's consider a sequence (a_i, b_i) generated by an iterative process (custom Collatz sequence), equivalent to the Collatz sequence, where:

a_i is the total number of odd steps taken up to and including iteration i ;

b_i is the total number of even steps taken up to and including iteration i ;

The difference $b_i - a_i$ it always grows with each iteration by 1 or 2 units.

Let's define two lines in the Cartesian plane:

- **Broken 1**: $(a_i, b_i - a_i)$ with start point $(0, 0)$

  Broken 2: $(a_i, f(a_i))$ with start point $(0, \log_2(N))$, defined by:

$$f(a_i) = \lceil a_i \cdot \lambda + \log_2(N) \rceil$$

  where $\lambda = \log_2(3) \approx 0{,}5849625$ and $f(a_i)$ is rounded to the next positive integer.

Theorem of the intersection between two lines

For every positive integer N, there exists at least one iteration s such that:

$$b_s - a_s = f(a_s)$$

that is, the two broken lines intersect at the point:

$$(a_s, f(a_s)) = (a_s, b_s - a_s)$$

Demonstration

1. **Feature growth**
   - The values of ai do not decrease in subsequent iterations.
   - The function $f(ai)$ is strictly increasing with respect to ai, being the sum of a strictly increasing linear function with inclination $\lambda = \log_2(3) \approx 0.5849625$ and a constant $\log_2(N)$.

- The difference $bi - ai$ always increases with each iteration of 1 or 2 units.

2. **Discreet behavior**
   - Both lines are defined on discrete sets.
   - Since $f(a_i)$ grows linearly and $b_i - a_i$ grows faster (**on average**), there is at least one point where the two functions coincide.
3. **Principle of discrete comparison**
   - Initially: $a_0 = 0$, $b_0 = 0$, then $b_0 - a_0 = 0$
   - But $f(a_0) = \lceil \log_2(N) \rceil > 0$, so $b_0 - a_0 < f(a_0)$
   - Then, for the monotonicity of the two functions, there is a first index s such that:

$$b_s - a_s = f(a_s) \qquad \textbf{c.v.d.}$$

Concrete example: $N = 30784$

From the iterative table (Table 3), it can be seen that:

- In every iteration i preceding s ($i < s$), the following inequality occurs:

$$b_i - a_i < f(a_i)$$

- To iteration $s = 14$:

  we have $a_s = 15 \quad b_s = 39 \quad b_s - a_s = 24$

$$f(a_s) = \lceil 15 \cdot 0{,}5849625 + \log_2(30784) \rceil = \lceil 8{,}7744375 + 14{,}909 \rceil = \lceil 23{,}683... \rceil = 24$$

$$\Rightarrow \quad b_s - a_s = f(a_s) \quad \Rightarrow \quad \text{intersection at the point } (15;24)$$

The point of intersection between the two lines represents a balance between the empirical growth of the sequence and the theoretical estimation provided by the function $f(a)$. This point can be interpreted as a threshold where iterative complexity coincides with logarithmic prediction.

6 Interpretation of results

Applying custom versus canonical Collatz succession reveals a significant difference in the number of iterations. This reduction is the result of optimized management of trajectories, based on:

Classification module 4, which allows you to immediately identify the type of orbit to be applied;

Elimination of the intermediate even steps, which in canonical succession slow down the path towards unity;

Use of the concept of isopath, which allows groups of numbers to be replaced with simpler equivalents without losing structural information.

In addition, the increasing difference between the total number of odd and even passes demonstrates a structural trend that favors convergence: the constant increase of 1 or 2 units of $b_i - a_i$ For each iteration *, I* not only speeds up the process, but suggests that the acceleration is systemic and not random. This definitely leads to values a_s and $b_s - a_s$ so that the two lines meet, and then the initial number N converges to 1 in the iteration s.

7 Conclusions

If the custom sequence maintains this efficiency for arbitrary values of N, new scenarios open up for a constructive proof of the Collatz conjecture, based on combinatorial and modular

criteria. In particular, the approach highlights how the information contained in the congruous numbers 1 and 3 (mod 4) is sufficient to describe the entire dynamics of the conjecture.

The custom Collatz sequence is not only an operational simplification, but a potential theoretical key to address one of the most famous open problems in elementary mathematics.

This way of proceeding in the custom sequence leads to the same results as the canonical Collatz sequence and does not depend on the initial number, as it applies in the same way and leads to the same results on integers with few digits as on integers with an unlimited number of digits.

Many tests have been carried out on different numbers, also containing a number of numerous digits, using a Python program of my own creation that faithfully follows my custom sequence. Tests carried out on numbers with many digits confirmed the veracity of the conjecture.

Riferimenti

[1] Ardito, Prof. Nicola — *Collatz's conjecture from an elementary point of view*.
Available on: https://independent.academia.edu/NICOLAARDITO1
[2] Ardito, Prof. Nicola — *Custom Collatz Sequence, Modular Reduction, Isopath Orbits and Analysis of Odd and Even Passages*.
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